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Cation-exchange membranes with polyaniline surface layer for water treatment

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Abstract

© 2014 D.D. Fazullin et al. Ion-exchange membranes are widely used in modern technologies, particularly in the field of water treatment and make it possible to considerably reduce expenses for wastewater treatment and ensure high degree of purification. Currently, perfluorinated sulfated proton-conducting membranes are often used, such as NAFION and its Russian analogue, MF-4SK based on co-polymerization product of a perfluorinated vinyl ether with tetrafluoroethylene. However, with development of the industry, materials with improved properties and lower cost are required. The aim is to obtain ion-exchange membranes for water treatment from metal ions and to study physico-chemical properties of obtained membranes. In this study, cation exchange composite membranes with modified polyaniline surface layer on nylon and PTFE substrate have been obtained. Changes in the structure of membranes were recorded using a microscope. Throughput capacity of the membranes was determined by passing a certain volume of distilled water through the membrane. The experiment intended to determine electivity of membranes was performed by passing a certain volume of metal salt solutions of a known concentration, after which the filtrate was collected. Concentrations of the studied metal ions in the original solution and in the filtrate were determined by the method of atomic adsorptive spectrometry with electro thermal atomization “Quantum Z.ETA”. Prepared highly selective ion exchange membranes. Properties of modified membranes, such as selective permeability and ion-exchange capacity have been determined. The membranes feature high selectivity for heavy metal ions. Moisture-retaining power and swelling ability of the membranes have been studied. Selectivity of the membrane to heavy metal ions is between 70 and 99%. Ion-exchange capacity of the obtained nylon polyaniline membrane is not inferior to some commercially available cationexchange membranes. Use of the modified membranes in the stage of tertiary wastewater treatment will ensure achieving established standards.

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Keywords

Exchange Capacity, Membrane, Metal Ions, Polyaniline, Selectivity